

FIX THE BALLARD ROADSIDE RAINGARDENS

SAVE OUR PUGET SOUND

Presented by residents on 29th Avenue NW and NW 77th between 28th & 30th

Blog: <http://ballardraingardengue.wordpress.com>

Facebook: "The Ballard Raingardengue" (Community Page)

29th Avenue NW and
NW 77th between 28th & 30th



29th Ave NW

NW 77th

WHO WE ARE > LOCATION

PROPOSED PILOT RAINGARDENS



Ballard is 25% of Seattle's run-off into Puget Sound.

This is the project we supported:

*One reason cited
for selection:
Community support*



Proposed
Raingarden



Original presentation described them:
“shallow vegetative depressions”



Vegetation:
“DIVERSITY -
It's a VERY
“good thing”!

- From SPU's Project
Presentation

*Pictures from SPU's
Pilot Project Presentation*

WHO WE ARE > THE BEGINNING

SAVE OUR PUGET SOUND

Fix the Ballard Roadside Raingardens

ISSUES

PROTOTYPE DESIGN

Standing water until
72 hours after rain stops



Applying 2010 Rainfalls to Design
Stretches with no rain/trace (≥ 3 days)
Subtracting 3 days to drain ("dr")

| January | February | March | April |
|------------------------|------------------------|------------------------|------------------------|
| $3 - 3 \text{ dr} = 0$ | $6 - 3 \text{ dr} = 3$ | $3 - 3 \text{ dr} = 0$ | $4 - 3 \text{ dr} = 1$ |
| $4 - 3 \text{ dr} = 1$ | | $3 - 3 \text{ dr} = 0$ | |
| 1 day | 3 days | 0 days | 1 day |

5 days with no standing water in 4-month period

DEFINITION BASED ON DESIGN:

Water-retention pond

(Reference: Groundwater Foundation)



Picture of Naturalized Urban Detention Basin



**ISSUES > STANDING WATER >
PROTOTYPE DESIGN**

INEFFICIENCY

Raingardens not draining or percolating too slowly.



- Clay soil
- Vashon Glacial Till (first 17 feet)
- Water table too high in places (former creek?)
- Only 2 spots tested



| Date | Standing Water Observed | | | | | | Inches of Rainfall |
|------------|-------------------------|--------|--------|--------|--------|--------|--------------------|
| | Cell A | Cell B | Cell C | Cell D | Cell E | Cell F | |
| 12/10/2010 | | | | | | X | 0.70 |
| 12/11/2010 | | X | | | X | X | 0.00 |
| 12/12/2010 | | X | | | X | X | 1.42 |
| 12/12/2010 | X | X | X | | X | X | 2.19 |
| 12/13/2010 | | | X | | X | X | 0.46 |
| 12/14/2010 | | | X | | X | X | 0.82 |
| 12/15/2010 | | | X | | X | X | 0.11 |
| 12/16/2010 | | | X | | | X | 0.02 |
| 12/17/2010 | | | | | | | 0.00 |
| 12/18/2010 | | | X | | X | X | 0.08 |
| 12/19/2010 | | | X | | X | X | 0.14 |
| 12/20/2010 | | | X | | X | X | 0.03 |
| 12/21/2010 | | | X | | X | X | 0.01 |
| 12/22/2010 | | | X | | X | X | 0.01 |
| 12/23/2010 | | | X | | X | X | 0.25 |
| 12/24/2010 | | | X | | X | X | 0.44 |
| 12/25/2010 | | | X | | X | X | 0.32 |
| 12/26/2010 | | | X | | X | X | 0.09 |
| 12/27/2010 | | | X | | X | X | 0.44 |
| 12/28/2010 | | | X | | X | X | 0.02 |
| 12/29/2010 | | | | | X | X | 0.09 |
| 12/30/2010 | | | | | | X | 0.00 |
| 12/31/2010 | | | | | | X | 0.00 |

Cells C, E, F not functioning

% of Raingardens *not* draining well:

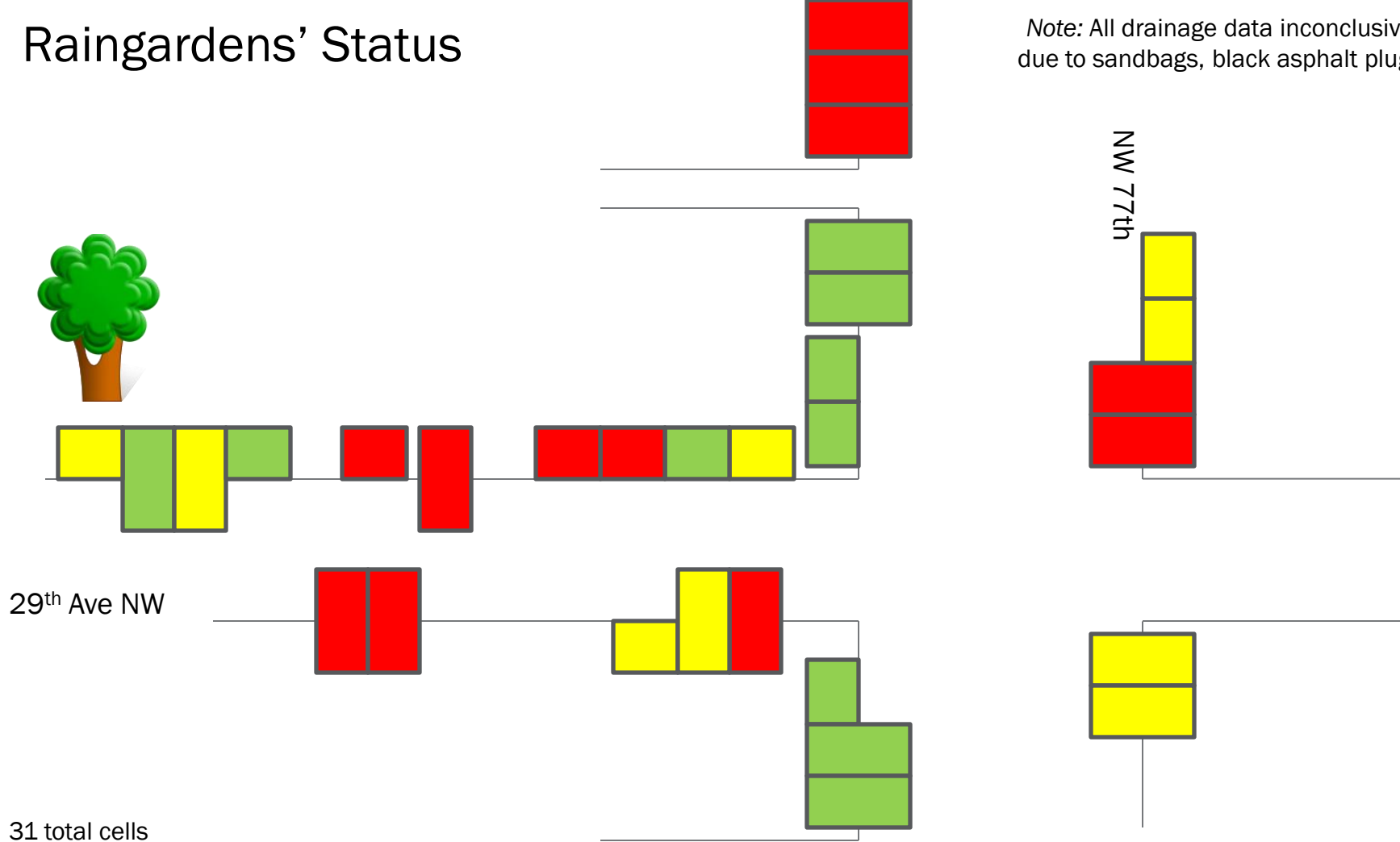
| | | |
|-------------------------|------------|-----|
| SPU Measurements | 12/17/2010 | 50% |
| Residents' Measurements | 01/27/2011 | 68% |

Note: All drainage data inconclusive due to sandbags, black asphalt plugs

ISSUES > STANDING WATER > INEFFICIENCY

Raingardens' Status

Note: All drainage data inconclusive due to sandbags, black asphalt plugs



| | | |
|-------------------------------------|----------|-----|
| Not draining at all – irrecoverable | 12 cells | 39% |
| Not draining – possibly recoverable | 9 cells | 29% |
| Draining / functioning properly | 10 cells | 32% |

ISSUES > STANDING WATER > MAP

Drowning Hazard

- Standing water should not exceed number of inches of water within which a child could drown.
- Children attracted to ponds, mud.
- Grass that could entangle a leg or arm planted at the bottom of Raingardens.
- Ground is “spongy,” which could trap child’s foot or hand.
- **Critical liability for City.**

OUR CHILDREN



Babies & Toddlers

1 - 2 inches of pooling water is hazard

- Sources:
 - WA State Drowning Prevention Network
 - OR Department of Health and Services
 - American Academy of Pediatrics (AAP)
 - Children’s Hospital
 - Safe Kids USA
 - Consumer Reports
- SPU data: 50% of Raingardens had more than 2 inches of water.

From WA State Drowning Prevention Network:

- Drowning is second leading cause of unintentional injury-related death to children.
- Eliminate Potential Hazards: #1 Empty all buckets, containers, and wading pools.



Warning label on
5-gallon buckets



Preschoolers & School Children

6 inches of pooling water is hazard

- SPU says it should not allow water deeper than six inches for school children (Chris Woelfel, SPU, “Drainage Issues in Roadside Raingardens,” MyBallard.com, October 2010).
- SPU data: 13% of Raingardens had more than 6 inches of water.

ISSUES > STANDING WATER > SAFETY AND HEALTH >
OUR CHILDREN > DROWNING HAZARD

These are filled with muddy water that was not supposed to be there in an area that was once fairly safe for children to play in their front yard. You can be a diligent parent and tragedies can still happen, and the city does not need to do their part to increase the odds. That's like saying the city can store TNT and a detonator in our front yards and if you are a diligent parent it won't be an issue.

I never knew that some amount of standing water was allowable. I really never thought of child safety in the project. Isn't any amount of water dangerous for child safety?

[The City] had better start putting part of their paychecks into a fund to pay for the sudden death lawsuits by parents whose children are injured by these "water gardens."



not only are they....a hazard to small children (we have an 18-month old), but they don't drain

or open up. Just waiting for accidents.... to happen.

I have 3 kids ages 7, 4, and 1. I am definitely worried about a small child wandering off and falling into one of these. There is no doubt in my mind that these are drowning hazards.

Looking at the rain gardens, how can they not be a hazard for kids walking on the sidewalk?

Just wait till some ones kid does accidently drown in it, God forbid then everyone will be wanting heads to roll for this dangerous, dangerous ditch, and blame whoever they can....it is a clear concern.

In the end, sadly, you will likely need to band together and collectively retain counsel to demand attention to these often critical issues

like child safety.

They should put them in the traffic circles in the middle of intersections....they are away from where kids would be playing,

The issue of standing water is completely unacceptable.

...Someone is going to drown in those. Children walk to and from their elementary school every day through this neighborhood

More kids die every year from drowning than guns. This [article] specifically calls out rain ditches around your home, and details that drowning is a sudden occurrence.

I have a 20-month-old son and am quite concerned about the rain gardens on our block. They contain stagnant, standing water for long periods of time, and are an eyesore and a hazard. I would strongly caution anyone considering signing up for the rain garden program to discuss the pros and cons with a homeowner with a rain garden."

I had a daycare and one of the 18-month-old little boys I watched walked out from his parents' house and fell into two inches of rain water, hit his head, and drowned. He died in two inches. As well as distracted parents, even small amounts of water can be and are dangerous to children. FYI, children also drown in drainage "ditches" all over the north and southwest, or anywhere there is an amount of standing water, or moving water, or tub water, any type of water. Ever seen the warning label on buckets over 1 1/2 feet tall? It's a picture of a toddler drowning in the bucket. You all seem to know more about trying to "care" for our future earth, which I agree with, than our real future... our children. So stop acting like the serious hazards or concerns don't matter or exist...it's ignorant.

The Ballard raingardens are a danger to kids, adults, and will just attract mosquitoes if not handled correctly. We must learn from our Portland neighbors on how to do this safely.

I am shocked....the safety of our children is just as necessary.

I've worked in public health....More concerning to me is the amount of standing water and the lure of playing in a "pond" that is so inviting to small children. Having such a liability in front of my house would be a weight I would be loathe to bear.

**ISSUES > STANDING WATER > SAFETY AND HEALTH
> OUR CHILDREN > DROWNING HAZARD >**

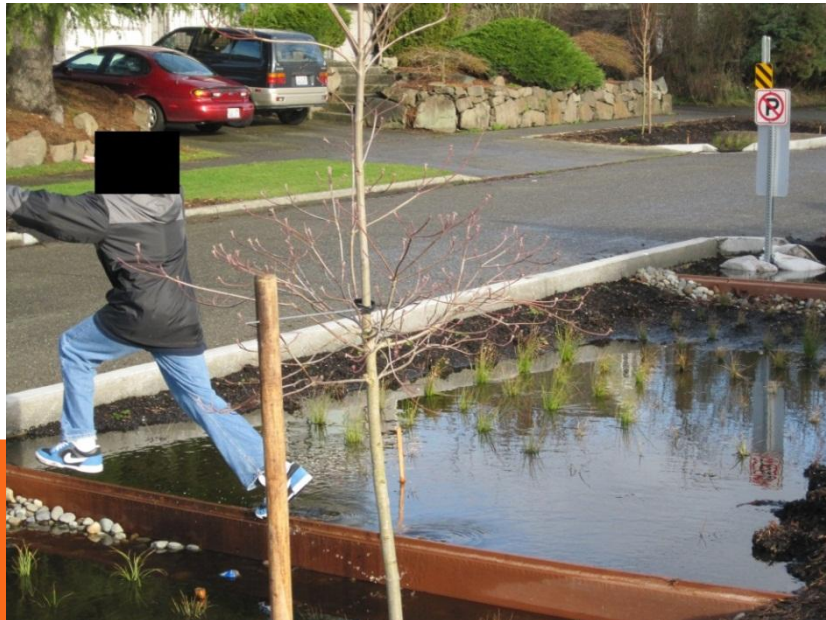
OUR CHILDREN

Plastic Weirs

- Children walk and run along slippery weirs
- Injury hazard (head)
- Knock head and fall into pooling water
- Aesthetics

Suggested Remedies

- Cover plastic weirs with earthen berms (exists over water supply lines)
- Replace plastic weirs with natural stone



Ice & Snow

- Children walk on frozen (and semi-frozen) Raingardens
- Children jump into pits during snow with ice underneath
- Excess water flows onto street and freezes (bicyclists)

Suggested Remedies

- No standing water
- No deep pits where water could quickly freeze

**ISSUES > STANDING WATER > SAFETY AND HEALTH >
OUR CHILDREN > PLASTIC WEIRS, ICE**

MOSQUITOS AND RODENTS

- Standing water a breeding ground for mosquitoes (promoting West Nile virus and other mosquito-borne illnesses).

- In functioning Raingardens, SPU's model requires majority of dry days in Seattle.

- Inefficient Raingardens: ~40% have standing water until pumped.
- SPU not pumping every three days (8-14 days).
- Leaves enough standing water for mosquitos to complete their lifecycle.

- From King Country DOH on West Nile:

- #1 Tip: "Get rid of mosquito breeding habitat near your house"
- Examples as small as birdbaths, puddles on tarps, leaky outdoor faucets

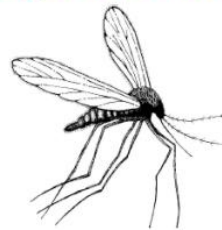
Applying 2010 Rainfalls to Design
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| March | April | May |
|------------------------|------------------------|------------------------|
| $3 - 3 \text{ dr} = 0$ | $4 - 3 \text{ dr} = 1$ | $4 - 3 \text{ dr} = 1$ |
| $3 - 3 \text{ dr} = 0$ | | $5 - 3 \text{ dr} = 2$ |
| | | $5 - 3 \text{ dr} = 2$ |
| No dry days | 1 dry day | 5 dry days |

6 dry days in Raingardens in Spring 2010

Fight the Bite



Public Health
 Seattle & King County

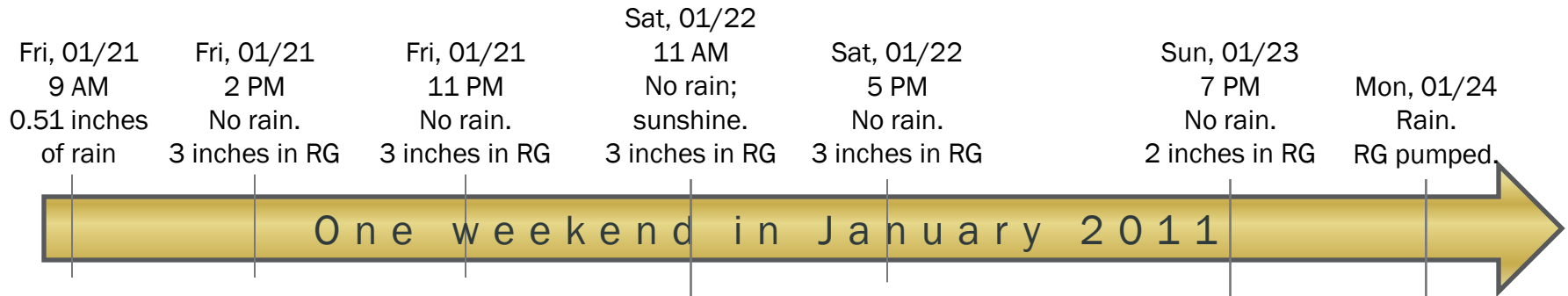
PETS

- Contaminants from run-off in standing water
- Danger to pets and wildlife drinking from ponds and cleaning themselves after entering

ISSUES > STANDING WATER > SAFETY AND
 HEALTH > MOSQUITOS & RODENTS, PETS

TEST CASE #1

Raingarden East side of 29th Ave NW
Location Midway between NW 80th and 77th
Note: Considered a potentially functioning Raingarden



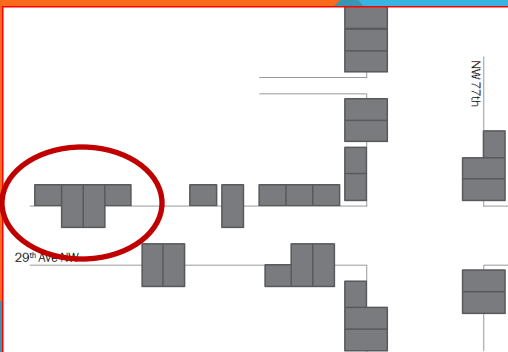
A



B



C



**ISSUES > STANDING WATER >
DESIGN & INEFFICIENCY > TEST CASE #1**

TEST CASE #2

Raingarden South side of NW 77th

Location Closest to 29th Ave NW

Note: Considered a non-functioning Raingarden

| | | | | | | | | |
|--------------|--------------|--------------|-------------|--------------|---------------|-------------|---------------|------------|
| Sun, 01/16 | Mon, 01/17 | Tues, 01/18 | Wed, 01/19 | Thur, 01/20 | Fri, 01/21 | Sat, 01/22 | Sun, 01/23 | Mon, 01/24 |
| 0.27 in/rain | 0.04 in/rain | 0.08 in/rain | No rain | 0.05 in/rain | 0.51 in. rain | No rain | 0.04 in/rain. | |
| 6 in. in RG | 6 in. in RG | 6 in. in RG | 6 in. in RG | 6 in. in RG | 6 in. in RG | 6 in. in RG | 6 in. in RG | RG pumped. |

One week in January 2011



A



B



C



ISSUES > STANDING WATER >
DESIGN & INEFFICIENCY > TEST CASE #2

SUGGESTED REMEDIES

Design

(functioning Raingardens)

- Raise bio-soil level
 - Better drainage, shallower Raingardens
 - Look and act like typical “Raingarden”
- Add mature plants and trees
- Add more vegetation
- Vary vegetation
 - Address drainage and depth

Target Timeline: Early Spring 2011

After bio-soil added, replant as necessary.

Inefficiency

(not draining immediately and constantly)

- Remove bump-out if Raingarden deemed ineffective (a “dud”).
 - Replace original plate



**ISSUES > STANDING WATER >
DESIGN & INEFFICIENCY > SUGGESTED REMEDIES**

NOT A SUGGESTED REMEDY

Submerged Drainage Pipes (for ineffective Raingardens)

- Residents theorize water table too high
 - Raingardens fill up hours after pumped when not raining
 - Newly-introduced/redirectioned drainage cause other problems: flood basements, etc.
- If pump to other cells, other cells too flooded
- Expensive:* Cells need to be dug out and replanted – more construction
 - Still trial and error

Drainage underneath will *not* resolve the following issues:

- Injury hazard: Plastic weirs
- Property devaluation
- Unattractive signage
- Lack of vehicle passenger egress
- Narrow streets (from bump-outs)
- Reduced parking for residents and guests



Water
Table

**STATUS OF RESIDENTS' GOALS >
NO DRAINAGE UNDERNEATH**

Aesthetic value is subjective

- “A messy neighbor can hamper your property by as much as 20 percent off the market value.”
- Sid Davis, author of *A Survival Guide to Selling a Home* (AMACOM, 2005).

Undesirable features:

- Ponds
 - Drowning hazards
 - Injury hazards
 - Health risks (e.g., West Nile Virus)
- Signage on residential street
 - Eyesore
 - Feel of commercial zone
- Lack of curbside access
 - No vehicle passenger egress
- Narrow streets (from bump-outs)
- Reduced parking for residents and guests



Potential buyers

- ~6,500 visitors to blog
- 106 Active Monthly Users on Facebook
- 1 favorable comment on appearance
- 51 unfavorable comments on appearance

Maintenance / Perpetual Care

- Management needed for plants and litter
- City's commitment for future?

ISSUES > PROPERTY VALUE DEPRECIATION

SUGGESTED REMEDIES

for functioning Raingardens

- Raise bio-soil level to 4" or less below grade
- Remove signage
 - Paint curbs, add lane stripes
- Create 24" level hard surface at curb without bump-outs
 - Re-instate pathways where stepping stone paths previously existed
 - Slope to drain into Raingarden
- Provide written commitment for perpetual care for plantings, trees, and Raingardens

OTHER OPTIONS

- Remove all bump-outs (water no longer entering as designed)
- Identify Raingardens as detention basins and relocate them



Award-winning Portland Raingarden (NE Siskiyou Green Street)

No signs



ISSUES >

PROPERTY VALUE DEPRECIATION

> SUGGESTED REMEDIES

Curb extension in Portland (NE 35th and Siskiyou)

SAVE OUR PUGET SOUND

Fix the Ballard Roadside Raingardens

RESIDENTS' GOALS CHECK





Support function of Raingardens – to decrease run-off into Puget Sound.



Eliminate all standing water in Raingardens.



Eliminate all signage. (This may require removal of bump-outs.)



Raise bio-soil so Raingardens are shallow vegetative depressions.

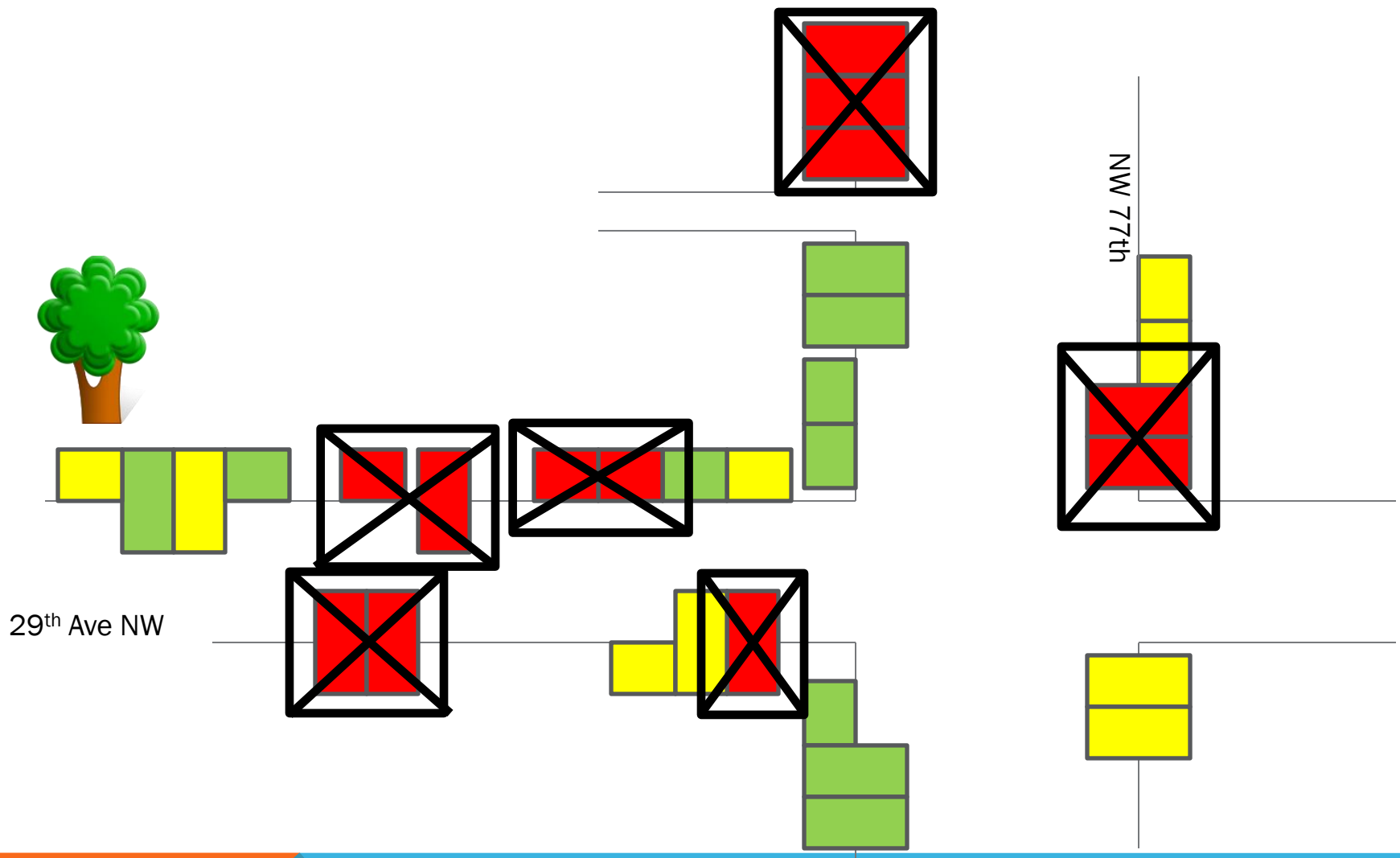


Improve Raingarden vegetation.



Remove bump-out if Raingarden is deemed ineffective (a “dud”).
Replace street with original plate.

STATUS OF RESIDENTS' GOALS

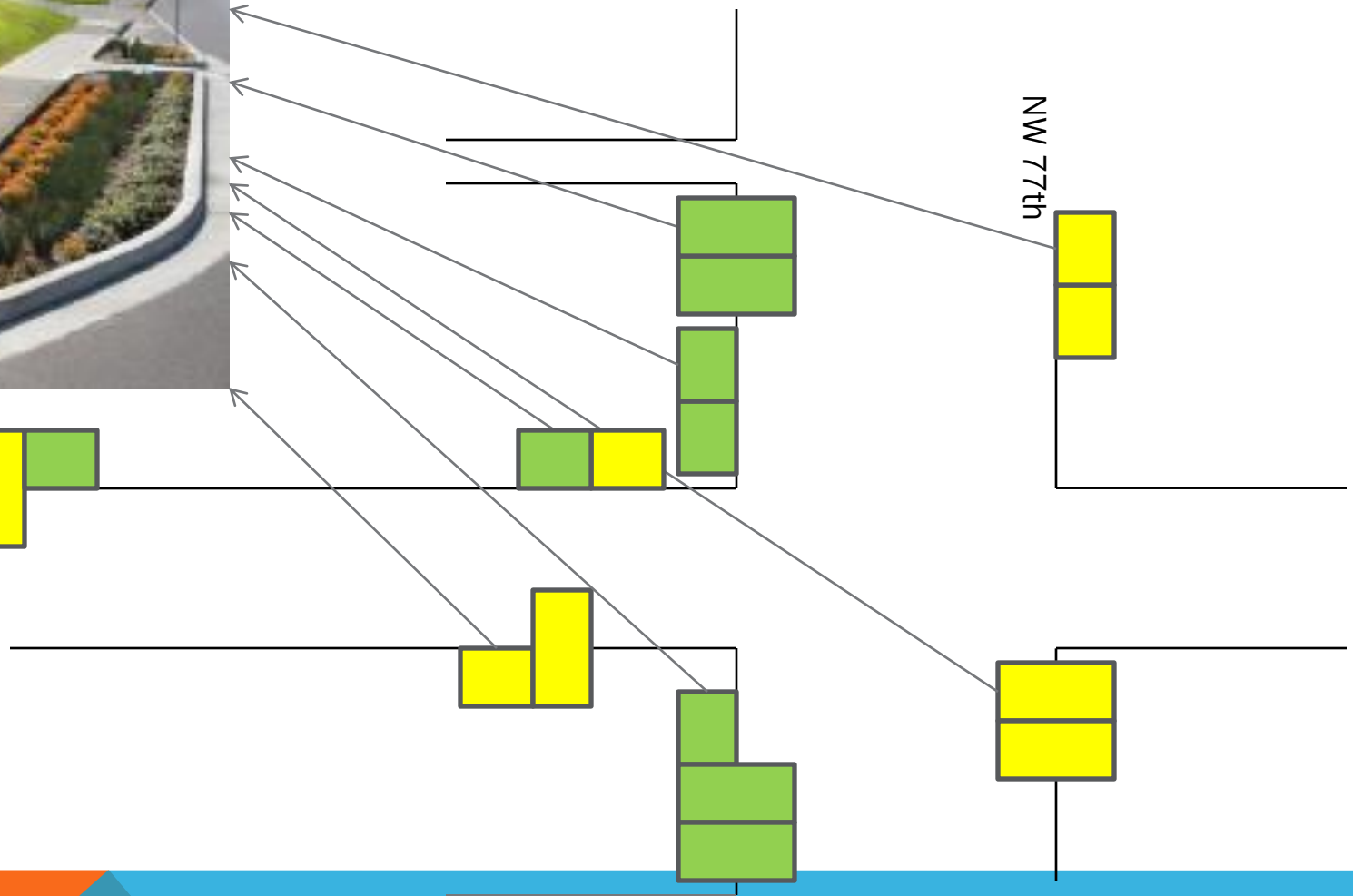


**STATUS OF RESIDENTS' GOALS > SUMMARY OF ASKS >
REMOVE INEFFECTIVE RAINGARDENS**



29th Ave NW

NW 77th



**STATUS OF RESIDENTS' GOALS > SUMMARY OF ASKS >
ENHANCE FUNCTIONING RAINGARDENS**

EXTENSION THROUGH FALL 2011

But waiting 12 to 36 months will *not* resolve the following issues:

- ✓ Ineffective Raingardens
 - Vegetation will not soak up amount of excess water
 - Submerged drainage pipes will *not* work below water table
- ✓ Prototype design still deep pits, holds pooling water
 - Drowning and injury hazard
 - Mosquitoes
- ✓ Property devaluation
 - Unattractive signage
 - No vehicle passenger egress
 - Narrow streets (from bump-outs)
 - Reduced parking for residents and guests



- No prolonged pumping of Raingardens
- Expensive during budget shortfall for city, state
 - Safety and health is dependent on if/when they pump

\$

\$

**STATUS OF RESIDENTS' GOALS >
EXTENSION THROUGH
FALL 2011**

SAVE OUR PUGET SOUND

Fix the Ballard Roadside Raingardens



COMMUNITY SUPPORT

COORDINATION BETWEEN BALLARD RESIDENTS AND S.P.U.



Ballard Residents' Asks

- Be transparent with goals, criteria, measurement of success
- Monitor ongoing Raingarden functioning
- Regularly provide data that measures effectiveness of functioning Raingardens
- Invite community representation (two residents) to determine criteria for effective drainage

Communication v. Coordination

**STATUS OF RESIDENTS' GOALS >
COORDINATION WITH S.P.U.**

I've worked in public health and am very concerned about the lack of drainage in these raingardens for several reasons....Whether these are not working due to lack of foresight of the physical inability of the gardens to drain or for other reasons, the facts speak for themselves and the gardens should be removed as a matter of public safety.

Having such a liability in front of my house would be a weight I would be loathe to bear. I really feel for the neighbors on this street who have to consider so many negatives every time they see the raingardens remaining full of water.

Thank you very much for sharing this, and I am really quite shocked to hear something negative about this....I don't understand why standing water should ever be present, furthermore I never knew that some amount of standing water was allowable. Isn't any amount of water dangerous for child safety?

Wow. How ugly. Do you not get mosquitos in Seattle?

While I do not live on your block, I sympathize with your plight, and I dread the inevitable day these "swales" come to my area.

Wow, I just checked the pictures....I'm so sorry that this is happening in Ballard.

I recently visited a friends home in Ballard and...in the dark I didn't know why it was so wet when there hadn't been a drop of rain in Seattle for days. Upon closer inspection I saw a GIANT mud puddle. A little research on what it was for floored me. The Ballard Raingardens are a danger to kids, adults and will just attract mosquitos if not handled correctly. We must learn from our Portland neighbors on how to do this safely.

I have a friend who unfortunately lives on 29th NW. I was aghast when I visited her and saw this "raingarden"....I am hoping that the city does not have my neighborhood in mind for this project.

"I thought I wanted the city to fix my neighborhood, now I don't. I really feel for you....Good luck to you and I hope you will get this resolved."

ugh...this sounds like a mess.

The issue of standing water is completely unacceptable. Rats? Mosquitos? Children? Pets? Someone is going to drown in those. Children walk to and from their elementary school every day through this neighborhood. For the city to leave three feet of open standing water is very negligent. I am shocked....No one is saying these are not necessary. But the beauty and sanctity of our neighborhoods, and the safety of our children are just as necessary. There is a way to make this work for everyone.

We also live in the neighborhood, at 72th and 28th—luckily not next to the raingardens. My biggest concern on reading this blog is that the city thinks they're working as planned—not only are they ugly, prevent curbside access and are a hazard to small children (we have an 18 month old) but they don't drain properly.

THAT'S what's been going on?????.... What a terrible idea! I understand why in theory it would work but to take away all the parking, cause elderly and all people to have a tough time maneuvering around the muddy holes, making the street an eyesore and allowing kids or animals to get sick from drinking or playing near it is awful! Again, thanks. I am so mad right now.

"You have my support, as I don't want these on my block!"

This is incredible! I can't imagine that this will actually remain the way it is once photos/comments make it to the major papers and news stations! It's horrendous.

I appreciate the idea of the raingardens but I do not support moving forward with the project in its current state. The goals are not unreasonable and if our Mayor and City Council members choose not to listen then their reelection is not an option.

If the raingardens on this street looked like the one in the picture by the park, with river rock, no standing water, and lots of lush landscaping, I don't think these neighbors would be complaining!

These are eyesores and safety hazards. Such a wasted opportunity for the city to destroy this neighborhood instead of embracing this opportunity and making an example of how beautiful these rain gardens can potentially be.

Blog:

<http://ballardraingardengue.wordpress.com>

Facebook:

“The Ballard Raingardengue” (Community Page)

Presentation will be posted on docs.com.



INFORMATION & RESOURCES

SAVE OUR PUGET SOUND

Fix the Ballard Roadside Raingardens

APPENDIX

Washington State Senator **Patty Murray**

Washington State Senator **Maria Cantwell**

Washington State Governor **Christine Gregoire**

Seattle Mayor **Mike McGinn**

Seattle City Councilmember **Mike O'Brien**

Seattle Public Utilities (SPU) Project Managers

Chris Woelfel

Karen York

Seattle Public Utilities (SPU) Media Relations

Andy Ryan

Seattle Public Utilities (SPU), Mgr., Combined Sewer Overflow

Andrew Lee

Seattle Department of Transportation (DOT)

Neighborhood Traffic Operations

Luke Korpi, P.E.

**BALLARD ROADSIDE RAINGARDENS PROJECT >
SPONSORS**

Drainage issues in roadside raingardens

Posted by Geeky Swedes on October 14th, 2010

To help reduce the amount of storm water that flows into the sewers, Seattle Public Utilities (SPU) is building roadside raingardens along 28th Ave NW.

The future raingardens are still under construction and some of them are filling up with water during major storms like we had last weekend, and aren't draining. "The swales have been filling up during the heavy rains and the water has been sitting in them for days without draining," Nancy, one of the neighbors emailed us. "A few days ago there was a group of folks with clipboards and cameras having a meeting on the sidewalk and looking at the full swales."


"The drainage capability of the rain gardens will improve when the all of the weirs are installed and the landscaping is planted, mulched and growing," Christine Woelfel, SPU Project Manager Supervisor tells us. "At present, some of the bio-engineered soil isn't draining as anticipated and we'll replace it before the plants and mulch go in."

Woelfel tells us that the inlets for many of the raingardens are plugged with sandbags to keep the water out during construction, and they've discovered that the seal isn't tight enough. "All this rain is complicating the construction and we've needed to pump out the rain gardens to dry them out quickly so the contractor can get back to work as soon as possible to complete the project," Woelfel says.

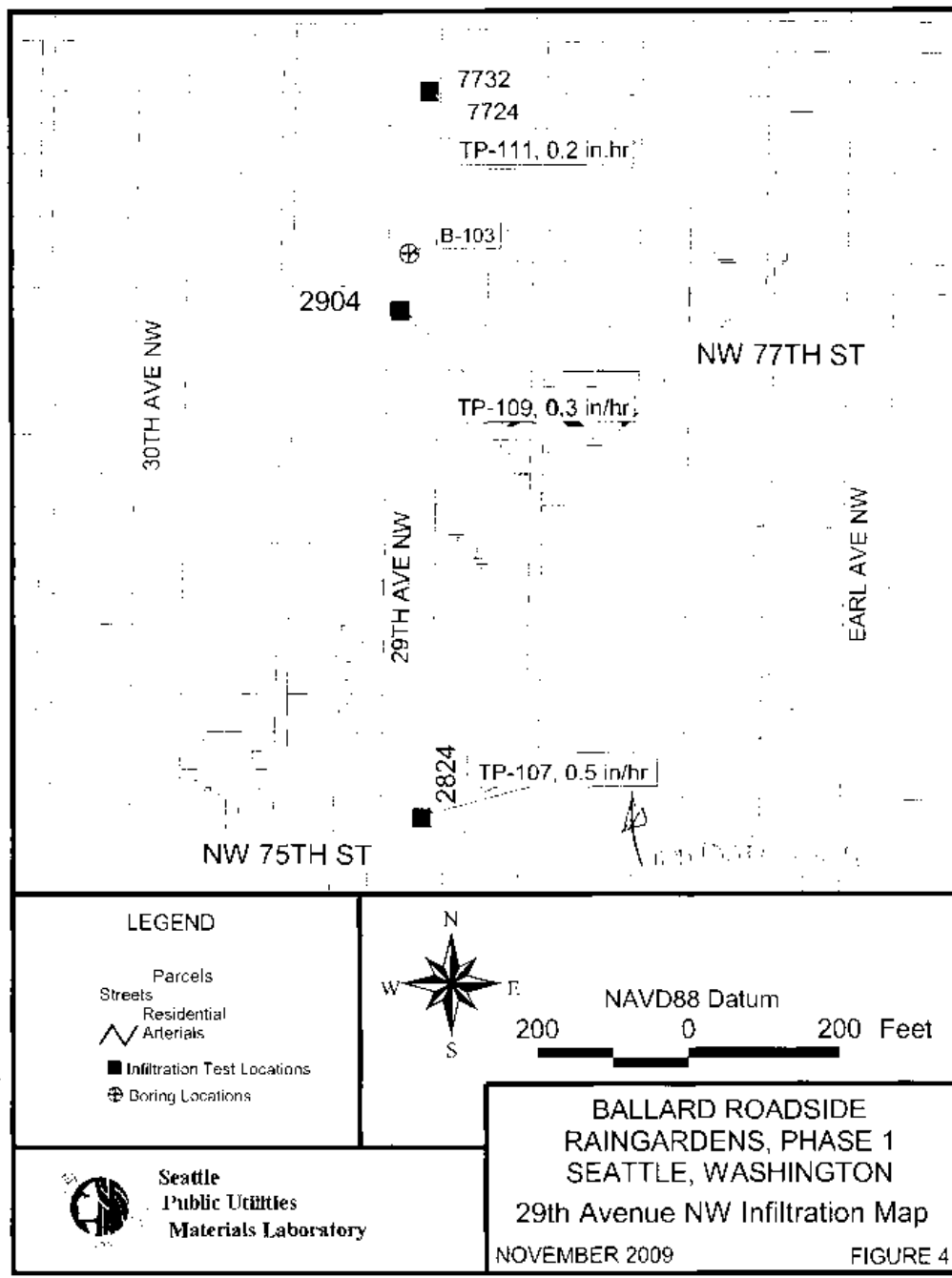
"Additionally, the water depth in some of the unfinished rain gardens was deeper than 6-inches," Woelfel says. "Since 28th Ave NW is a main path for school children, we wanted to be cautious and not allow deeper water, even on a temporary basis, so we pumped them out. Once the construction is done the raingardens will drain normally and pumping will be unnecessary." (Thanks Nancy for the email and photo of the city pumping the raingarden.)

<http://www.myballard.com/2010/10/14/drainage-issues-in-roadside-raingardens/>

MyBallard.com article

| LOG OF TEST PIT TP-109 | | Depth (ft) | Symbol | USCS | Samples | Probe Penetration (ft) | Lab tests | Groundwater | Depth (ft) | Penetration Resistance Probe Penetration (ft) | PL | Water Content % | LI |
|---|--|--|--------|---------------|---------|------------------------|-----------|-------------|------------|--|----|-----------------|----|
| SOIL DESCRIPTION | | 0 | | | | | | | 0 | 0.5 1.0 1.5 2.0 2.5 3.0 | | | |
| Surface is grass. Medium stiff to stiff, brown, SILT, few fine sand and gravel; dry; numerous organics (roots). | | | | | | | | | | | | | |
| GLACIAL TILL Stiff to very stiff, brown, SILT, trace sand and gravel; dry; scattered pockets of rust staining. | | | | ML | 1 | 0 | GSD | | | | | | |
| Very stiff to hard, brown, fine SANDY SILT, trace gravel, moist. | | | | ML | 2 | 0 | GSD | | | | | | |
| (Bag sample taken from 3 to 3.5 ft.) | | | | | | | | | | | | | |
| Test pit completed at 3.9 feet below ground surface. Falling head infiltration test performed. Test pit backfilled with spoils. | | | | | | | | | | | | | |
| LOG OF TEST PIT TP-110 | | Depth (ft) | Symbol | USCS | Samples | Probe Penetration (ft) | Lab tests | Groundwater | Depth (ft) | Penetration Resistance Probe Penetration (ft) | PL | Water Content % | LI |
| SOIL DESCRIPTION | | 0 | | | | | | | 0 | 0.5 1.0 1.5 2.0 2.5 3.0 | | | |
| Surface is grass. Medium stiff to stiff, brown, SILT, trace fine sand and gravel; dry; numerous organics (roots). | | | | | | | | | | | | | |
| FILL Stiff to very stiff, brownish red, SILT, trace gravel and fine sand; dry; scattered organics (roots). | | | | ML | 1 | 0.1 | GSD | | | | | | |
| Becomes soft to medium stiff, dark brown, moist; scattered partings of organics (roots). | | | | | | | | | | | | | |
| (Bag sample taken from 3 to 3.5 ft.) | | | | | | | | | | | | | |
| Test pit completed at 3.9 feet below ground surface. Falling head infiltration test performed. Test pit backfilled with spoils. | | | | | | | | | | | | | |
| Date Completed: 08/3/2009 Operator: Kelly's Excavating Equipment: Komatsu WB-140 Backhoe, 2 ft by 2 ft bucket | | | | | | | | | | | | | |
|  Seattle Public Utilities Materials Laboratory | | Ballard Roadside Raingardens, Phase 1 Seattle, WA | | C303101 | | FIGURE B-12 | | | | | | | |
| Logged by: DJ | | Reviewed by: TS | | Sheet: 1 of 1 | | | | | | | | | |

LOG OF TEST PIT



INFILTRATION MAP